NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

IRRIGATION WATER CONVEYANCE CORRUGATED, RIBBED OR PROFILE WALL THERMOPLASTIC PIPELINE

(No.)
CODE 430-JJ

DEFINITION

A pipeline and appurtenances installed in an irrigation system.

PURPOSE

To prevent erosion or loss of water quality or damage to land and to reduce water conveyance losses to make possible the proper management of irrigation water.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to circular corrugated, ribbed or profile wall thermoplastic pipe with vents open to the atmosphere.

The pipeline shall be planned and located to serve as an integral part of an irrigation water distribution or conveyance system that has been designed to help conserve soil and water resources on a farm.

Water quality, seasonal supplies and rates of irrigation delivery for the area served by the pipeline shall be sufficient to make irrigation practical for the methods to be used.

DESIGN CRITERIA

All planned work shall comply with all Federal, State, and local laws and regulations.

Flow velocity. The design velocity at system capacity shall not exceed 5 ft/s on pipelines with valves or other flow control appurtenances placed along or at the end of the pipeline.

Pipe Size. The pipe used under this standard shall be limited to the following maximum diameters:

Type of Pipe	Manning's "n"
PE Tubing (ASTM F 667 or AASHTO M294)	36 inches
PE Large Diameter Profile Wall (ASTM F 894)	120 inches
PVC Ribbed Drain Pipe (ASTM F 794 or AASHTO M304)	48 inches

Friction losses. For design purposes, friction head losses shall be no less than those computed by the Manning's Formula, using a roughness coefficient of 'n" as follows:

Type of Pipe	Manning's "n"
PE Corrugated Pipe	0.020
PE Corrugated Pipe w/liner	0.012
PE Profile Wall Pipe	0.009
PVC Ribbed Pipe	0.009

Pressure Head. The maximum design pressure head on the pipe as measured from the centerline of the pipe shall not exceed the following:

Type of Pipe	Pressure Head
PE Corrugated Pipe w/ watertight couplers	12 feet
PE Profile Wall Pipe	25 feet
PVC Ribbed Pipe	25 feet

Capacity. The design capacity of the pipeline shall be based on whichever of the following criteria is greater:

1. The capacity shall be sufficient to deliver the volume of water required to meet the

irrigation demands of the crop(s) to be irrigated.

2. The capacity shall be sufficient to provide an adequate irrigation stream for the method(s) of irrigation being used.

External load limit. The maximum external load for each Pipe Stiffness (PS) class or Ring Stiffness Constant (RSC) shall be in accordance with the pipe manufacturer's recommendation. External load shall include earthfill and any live load as applicable. Equivalent fill heights for 16,000 and 10,000 pound point live loads are:

Depth of Cover on Pipe (Ft)	Point Live Load (Lbs)	Live Load Equivalent Fill Height (Ft)	Total Design Fill Height (Dead + Live (ft))
2.5	10,000	9	11.5
	16,000	14	16.5
3.0	10,000	6	9
	16,000	10	13
4.0	10,000	3	7
	16,000	5	9
5.0	10,000	2	7
	16,000	3	8
6.0	10,000	1	7
	16,000	2	8
8.0	10,000	1	9
	16,000	1	9
10.0	10,000	0	10
	16,000	0	10

Vents. Vents shall be designed as needed to allow for the removal and re-entry of air and to provide protection from surge. Vents shall be located at the upstream end of the pipeline, at high points along the pipeline, at points where there are changes in grade along the pipeline of 10 degrees or more or at a maximum spacing of 1320 feet along the length of pipelines not having other outlets open to the atmosphere. Vents shall be sized a minimum of ¼ the diameter of the pipeline. Vents shall have a minimum freeboard of 1-foot above the hydraulic grade line. The maximum height of the vent shall not exceed the maximum allowable pressure head for the pipe material.

Outlets. Appurtenances for delivering water from the pipe to a field surface, to a ditch or a surface pipe system shall have the capacity to deliver the required flow to:

1. a point at least 6 inches above the field surface.
2. the hydraulic grade line of the ditch or pipeline.

Pipeline placement. Pipelines shall be buried with a minimum of 18 inches of cover. Pipelines which are not subject to hazards such as, traffic crossings, farm operations, freezing temperatures or soil cracking have a minimum of 30 inches of cover.

Joints and connections. All connections shall be designed to withstand the maximum working pressure of the pipeline without leakage and to leave the inside of the pipeline free of any obstruction.

Fittings and appurtenances. Standard fittings shall be used when available. Elbows, tees, reducers, valves shall equal or exceed the pressure rating of the pipe on which they are used.

Draining and flushing. Provisions shall be made for completely draining the pipeline where freezing is a hazard. As needed drains will be provided at low points along the pipeline or provisions shall be made to empty the pipeline by pumping.

Materials. Pipe shall equal or exceed the requirements specified in one of the following standards:

ASTM F 667 or AASHTO M 294 "Corrugated Polyethylene (PE) Tubing and Fittings"

ASTM F 794 "Poly-Vinyl Chloride (PVC) Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based Upon Inside Controlled Diameter"

ASTM F 894 "Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe"

AASHTO M304 "Poly-Vinyl Chloride (PVC) Ribbed Drain Pipe and Fittings Based Upon Inside Controlled Diameter"

Trench. The trench below the top of the pipe shall be only wide enough to permit the pipe to be easily placed and joined and to allow the initial backfill material to be placed under the haunches of the pipe. The maximum trench

width shall be 30 inches greater than the diameter of the pipe. If the trench is precision excavated and has a semicircular bottom that closely fits the pipe, the width shall not exceed the outside diameter of the pipe by more than 10 percent.

The trench bottom shall be uniform so that the entire length of the pipe has contact with soil without bridging. If rocks, boulders or any other material that can damage the pipe are encountered, the trench bottom shall be undercut a minimum of 4 inches below final grade and filled with bedding material.

Backfill. The initial backfill shall be angular 1/4 to 1 inch size graded, crushed stone with a maximum of 10 percent noncohesive fines or sands and gravels with a maximum particle size of 1 inch containing a maximum of 12 percent noncohesive fines or sands with a maximum of 45 percent passing a #40 sieve.

The initial backfill shall be placed from the bottom of the trench to a height of at least 0.7 of the pipe diameter.

All special backfill requirements of the pipe manufacturer shall be met.

Final backfill. The final backfill shall be free of large rocks, frozen clods and other debris larger than 6 inches in diameter. However within 9 inches of the top of the pipe the maximum size of material shall not exceed 1-1/2 inch in diameter.

Testing. The pipeline shall be tested for leakage and proper functioning. The tests may be performed before backfilling or anytime after the pipeline is ready for service.

Certification and guarantee. The installing contractor shall certify that his/her installation complies with the requirements of this standard. The Contractor shall furnish a written guarantee that protects the owner against defective workmanship and materials for a period of not less than 1 year. The certification shall identify the pipe manufacturer and markings on the pipe being supplied.

CONSIDERATIONS

Underground pipelines should be tested for leaks before placing final backfill. All leaks should be repaired.

Consider effects on the water budget, especially on volumes and rates of runoff to downstream water users.

Consider the effects on wetlands and water related wildlife.

Consider effects on water flows and aquifers and the affect to other water uses and users.

Consider the potential effect on irrigation water management.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared to show site specifics. The drawings and specifications shall show pipe location, pipe type and sizes, details for appurtenances, trench/backfill requirements as applicable.

OPERATION AND MAINTENANCE

The operation and maintenance of the system shall include typical items of flushing and draining pipeline, checking air vents, etc.

REFERENCES

- Engineering Field Manual

  Chapter 3, Hydraulics

  Chapter 15, Irrigation

- NRCS Conservation Practices

  Structure for Water Control, Code 587

  Irrigation System, Surface and Subsurface, Code 443

  Irrigation Water Conveyance, Irrigation Pipeline, Code 430AA to 430HH